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Initial Characterization of a Novel 2D Computed Radiography (CR) Dosimeter for SBRT

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Presentations

SU-E-T-497 (Sunday, July 12, 2015) 3:00 PM - 6:00 PM Room: Exhibit Hall

Purpose: For 2D, sub-mm resolution dose measurements Gafchromic™ EBT film is currently a standard in radiotherapy; mainly because of its energy independence and water equivalence. However, EBT film is disposable. Therefore, the dosimetric and uniformity characteristics needs to be estimated from a second, possibly different, (calibration) film. Moreover, EBT has a post-irradiation coloration and a non-linear dose dependence with saturation, which limits the applicable time interval and dose range.

CR technology forms an interesting alternative for EBT. Dose dependent CR-plates have a sub-mm resolution, and additionally a linear dose dependence over decades of dose. But, CR has an inherent signal fading and energy dependence. Here, for the first time, a radiotherapy 2D CR prototype was characterized for an extended dose range (up to 35Gy), signal fading, and basic energy dependence.

Methods: The prototype was irradiated with a standard 10x10cm 6MV photon beam, and scanned with a commercial CR 15-X(R) scanner. The time between the start of irradiation and scanning (T_Scan) was monitored. The linearity of the dose response was evaluated between 0 and 35Gy using a fixed T_Scan of 4min, if possible (i.e. ≤10Gy). Next, the signal fading was characterized for a T_Scan-range of 4 to 20min. The energy dependence was assessed by a comparison of out-of-field measurements of CR, EBT, and TLD.

Results: The radiotherapy CR prototype has a linear response over the complete SBRT dose range (0-35Gy). The prototype had a small (5%), but linear signal fading over the time interval of interest (4-20min). Out-of-field, the prototype has a 8% over response due to an increased amount of low energy photons. The impact of the over response on intensity modulated radiotherapy remains to be evaluated.

Conclusion: CR technology is promising for SBRT dose measurements up to 35Gy. It is a reusable linear alternative for film dosimetry.

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